CLAIMS:

1. An imaging method for use in automatic monitoring the body condition of an animal, the method comprising:

i) imaging a predetermined region of interest on the animal body, and generating data indicative thereof;

ii) processing the generated data to obtain a three-dimensional representation of the region of interest;

iii) analyzing said three-dimensional representation to determine a predetermined measurable parameter indicative of a surface relief of the region of interest indicative of the body condition.

2. A method for optimizing nutrition of an animal, the method comprising automatically monitoring the energy balance of the animal, said monitoring comprising:

i) imaging a predetermined region of interest on the animal body, and generating data indicative thereof;

ii) processing the generated data to obtain a three-dimensional representation of the region of interest;

iii) analyzing said three-dimensional representation to determine a predetermined measurable parameter indicative of a surface relief of the region of interest indicative of the energy condition of the animal.

3. The method according to Claim 1 or 2, for determining the body condition score (BCS) of a dairy cow, said region of interest including at least one of the following body parts: the rear part of the cow in the vicinity of its tail head and at least one of the dorsal parts of the cow.

4. The method according to any one of preceding Claims, wherein said imaging comprises illuminating the region of interest by structured light in the form of an array of spaced-apart light components to thereby illuminate an array of spaced-apart locations within the region of interest, and collecting light returned from the illuminated locations.

5. The method according to any one of preceding Claims, wherein said processing of the three-dimensional representation utilizes reference data representative of the body condition scales and corresponding values of said predetermined measurable parameter indicative of the curvature of the region of interest.

6. The method according to Claim 5, wherein said predetermined measurable parameter indicative of the curvature of the region of interest is representative of a depth of the region of interest.

7. The method according to any one of preceding Claims, wherein said specific measurable parameter is indicative of the curvature of the surface of the region of interest with respect to a predefined reference plane.

8. The method according to Claims 3 and 7, wherein said reference plane is tangential to the dorsal or the rear part of the cow at the point of pin bone and tail.

9. The method according to Claim 7, wherein said specific measurable parameter is representative of at least one of the following: a distance between the reference plane and a point in the region of interest mostly distant from said reference plane; a surface area defined by the illuminated surface locations in a plane perpendicular to said reference plane and including the mostly distant point; and at least a part of a volume defined by the illuminated surface locations and said reference plane.

10. The method according to Claim 4, wherein said array of incident light components is produced by passing a light beam generated by a light emitting element through a mask accommodated in the path of the emitted light beam, thereby splitting the emitted light beam into the array of the spatially separated light components.

11. The method according to Claim 4, wherein said array of incident light components is produced by light generated by an array of light emitting elements, respectively.

12. The method according to any one of preceding Claims, wherein the processing of said generated data comprises determining a relative shift of the

illuminated locations from a relative location of the corresponding light component in the array of light components, said shift being caused by the curvature of the illuminated surface and being indicative of said curvature.

13. The method according to Claims 7 and 12, wherein said shift is representative of a distance between the respective illuminated location and said reference plane.

14. The method according to Claims 12 or 13, wherein said imaging of the region of interest comprises acquiring an image of the region of interest, said shift being a distance between the illuminated location on the curved surface of the body part and a corresponding location along the trajectory of the corresponding light component.

15. The method according to Claim 12 or 13, wherein said imaging of the region of interest comprises acquiring at least two images of the region of interest with different angles of collection of light returned from the region of interest, said shift being a distance between two illuminated locations of a matching pair of locations in the two images.

16. The method according to any one of preceding Claims, wherein the imaging comprises acquiring a sequence of images of the region of interest by a single camera at different relative positions between the camera and the region of interest.

17. The method according to Claim 16, wherein said camera is a video camera.

18. The method according to any one of preceding Claims, wherein said imaging is carried out during a movement of the animal along a predetermined path.

19. The method according to any one of preceding Claims, wherein the processing of said generated data comprises determination of central points of all illuminated locations in the image of the region of interest.

20. The method according to Claim 19, wherein the data representative of the acquired images is indicative of the existence of at least one of the following

conditions: an in-coordination in the natural movement of the cow, and changes in the natural movement of the cow.

21. The method according to any one of Claims 3 to 20, comprising imaging an additional region of interest in the vicinity of the transverse processes of the lumbar vertebrae and the spinous processes of the lumbar vertebrae of the cow, and determining the BCS with respect to this additional region of interest, thereby enabling determination of a tendency of the energy balance change for the imaged cow.

22. A method for monitoring the condition of an animal, the method comprising:

- imaging the cow while marching along a predetermined path and generating data indicative of the acquired images;
- analyzing said data to identify the existence of a certain pattern of locomotion or in-coordination in the cow's marching, said pattern being indicative of the existence of neurological disorders associated with nervous system diseases of the animal..

23. An imaging method for use in automatic monitoring the body condition score (BCS) of a dairy cow, the method comprising:

- imaging a first region of interest on the cow's body in the vicinity of the transverse processes of the lumbar vertebrae and the spinous processes of the lumbar vertebrae of the cow, and a second region of interest on the cow's body in the vicinity of its tail part, and generating imaged data;
- processing the imaged data to obtain a three-dimensional representation of the first region of interest and the second region of interest;
- analyzing the three-dimensional representation to determine a predetermined measurable parameter indicative of a surface relief of the region of interest, thereby determining first and second BCS values for the first and second regions of interest, respectively, a

difference between the first and second BCS values being indicative of a tendency in the cow energy balance condition.

24. A system for monitoring the body condition of an animal, the system comprising:

(a) an optical device including an illuminating assembly operable to produce structured light in the form of an array of spatially separated light components to thereby illuminate an array of locations within a predetermined region of interest on a body part of the animal, and a light detection assembly operable for acquiring at least one image of the illuminated body part by collecting light scattered therefrom and generating data indicative of the acquired image;

(b) a control unit connectable to the optical device, the control unit comprising a memory utility for storing reference data representative of the body condition scales and corresponding values of a predetermined measurable parameter that is indicative of the curvature of the predetermined region of interest; and a data processing and analyzing utility preprogrammed for processing the data indicative of the acquired image to calculate a value of the measurable parameter for the specific imaged animal, and analyze the calculated value with respect to the reference data to thereby determine the body condition scale of the specific animal.

25. The system according to Claim 24, configured for monitoring a body condition score (BCS) of dairy cows, said region of interest including at least one of the following oart of the cow's body: at least one of the dorsal parts, and the rear part of the cow in the vicinity of its tail head.

26. The system according to Claim 24 or 25, wherein the illuminating assembly comprises a light emitting element operable to emit a light beam, and a mask accommodated in the path of the emitted light beam to split it into the array of spatially separated light components.

27. The system according to Claim 24 or 25, wherein said illuminating assembly comprises an array of light emitting elements operable to emit the array of light components, respectively.

28. The system according to any one of Claims 24 to 27, wherein the detection assembly comprises a single pixel-array detector.

29. The system according to Claim 28, wherein said detector is a video camera, the control unit comprising a frame grabbing utility.

30. The system according to any one of Claims 24 to 27, wherein the detection assembly comprises two pixel-array detectors.

31. The system according to Claim 28, wherein said two pixel-array detectors are oriented with respect to the region of interest so as to acquire two images with different collection angles, respectively.

32. The system according to any one of Claims 24 to 31, wherein said data processing and analyzing utility is operable to determine a shift of each of the illuminated locations within the array of the illuminated locations caused by the curvature of the illuminated surface, said shift being indicative of said curvature.

33. The system according to any one of Claims 24 to 32, wherein said shift is a distance between the illuminated location on the curved surface of the body part and a corresponding location along the trajectory of the corresponding light component.

34. The system according to any one of Claims 24 to 32, wherein said shift is a distance between the two illuminated locations of a matching pair of locations in the two images.

35.The system according to any one of Claims 24 to 34 , wherein the processing and analyzing utility is operable to determine central points of all the illuminated locations.

36. The system according to any one of Claims 24 to 35, wherein said predetermined measurable parameter indicative of the curvature of the region of interest is representative of a depth of the region of interest.

37. The system according to any one of Claims 24 to 36, wherein said predetermined measurable parameter is indicative of the curvature of the surface of the region of interest with respect to a predefined reference plane.

38. The system according to Claim 25 and 37, wherein said reference plane is tangential to the rear part of the cow at the point of spin bone and tail.

39. The system according to Claim 37 or 38, wherein said predetermined measurable parameter is representative of at least one of the following: a distance between said reference plane and a point on the region of interest mostly distant from said reference plane; a surface area defined by the illuminated surface locations in a plane perpendicular to said reference plane and including the mostly distant point; and at least a part of a volume defined by the illuminated surface regions and said reference plane.

40. The system according to any one of Claims 37 to 39, wherein said shift is representative of a distance between the respective illuminated location and said reference plane.

41. The system according to any one of Claim 24 to 40, wherein said data processing and analyzing utility is preprogrammed to analyze the data indicative of the images acquired during natural marching of a dairy cow to determine existence of a certain locomotion pattern or in-coordination in the cow's marching.